

# Variants of Neuropsychological Syndrome and Stages of Genesis of A.R. Luria's Concept of the Brain Organization of Mental Functions

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The article is dedicated to one of the basic concepts of Russian neuropsychology — the concept of the “neuropsychological syndrome”, uniquely associated with the name of Alexander Romanovich Luria. Earlier, A.R. Luria became world famous by virtue of his works devoted to the study of deep, unconscious, and even taboo phenomena of the psyche. This area of Luria's work, which is close to the psychoanalytic paradigm, was interrupted in the late 1930s in the USSR for ideological reasons. A.R. Luria redirecting the field of research into the connections between the psyche and the brain to such sections of medicine as neurology and neurosurgery. The syndromic approach to the analysis of disorders of mental functions in local lesions of the brain becomes the method of studying this problem. To date, the ideas about the reasons for its variability within the textbook typology remain insufficiently covered and systematized. Recently, the problem of properly understanding and describing syndromes of mental disorders in the Lurian approach became especially relevant due to the expansion of neuropsychological diagnostic applications. This article analyzes the main stages in the development of the concept of the neuropsychological syndrome in the works of A.R. Luria. It also describes the main factors that determine the variability of the syndromes of disorders of brain function.

**Keywords:** neuropsychology, syndrome analysis method, syndrome, symptom, factor, syndrome variation.

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# Варианты нейропсихологического синдрома и этапы генеза концепции А.Р. Лурии о мозговой организации психических функций

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Статья посвящена одному из основных понятий отечественной нейропсихологии — понятию «нейропсихологический синдром», однозначно связанному с именем Александра Романовича Лурия. Ранее Лурия получил мировую известность благодаря работам, посвященным исследованию глубинных, неосознаваемых и даже табуированных личностью явлений психики. Это направление работы, близкое к психоаналитической парадигме, в конце 30-х годов XX века в СССР было прервано по идеологическим причинам. А.Р. Лурия переадресует область исследований связей между психикой и мозгом в такие разделы медицины, как неврология и нейрохирургия. Методом изучения данной проблемы становится синдромный подход к анализу нарушений психических функций при локальных поражениях головного мозга. До настоящего времени остаются недостаточно освещенными и систематизированными представления о причинах вариативности синдрома в рамках хрестоматийной типологии. В последние годы в связи с расширением областей применения нейропсихологической диагностики проблема правильного понимания и описания синдромов нарушений психических функций в лурьевском подходе особенно актуальна. В статье проанализированы основные этапы развития представлений о нейропсихологическом синдроме в работах самого Александра Романовича Лурия, описаны основные факторы, детерминирующие вариативность синдромов нарушений высших психических функций.

**Ключевые слова:** нейропсихология, метод синдромного анализа, синдром, симптом, фактор, вариативность синдрома.

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## Introduction

Neuropsychology, and one of its basic concepts — the concept "neuropsychological syndrome" — are closely associated with A.R. Luria in Russian academia.

When the concept emerged, Luria was already world-famous thanks to his works devoted to the study of deep, unconscious, and even taboo phenomena within the psyche. A special place in these studies was occupied by his method for studying mental phenomena hidden from direct observation [19, 28]. Modifications of his method have proven to be transcendent and are used in practice in lie detector tests. This area of Luria's work, which is adjacent to the psychoanalysis, was interrupted in the late 1930s in the USSR for ideological reasons.

In our country, the period from the 1930s to the early 1960s was quite difficult for the study of psychology as a whole. Earlier, I.P. Pavlov had said that it was difficult to "put the non-spatial representations of psychology on the spatially organized tissue of the brain" [1; 26]. This thesis was explored by his students and followers in the 1950s when psychology was under ideological pressure and even the viability of psychology's existence as a materialistic science was raised. While the connection between behavior and the brain was obvious, mental functions were reduced to conditioned reflexes, which deprived psychology as a science of its own experimental basis for studying the problem of the psyche and the brain.

During the war, A.R. Luria worked in a military hospital in the Urals — in Kisegach. Afterward, in 1947, he published the book *Traumatic Aphasia* [20]. The title of the book is perceived as purely medical, with Luria defending psychology, in a sense, by redirecting the field of research on the connections between the psyche and the brain toward such areas of medicine as neurology and neurosurgery. Nevertheless, the book clearly shows that speech disorders are syndromes of brain disorders.

In 1962, a cycle of publications was released on the problem of Brain and Mental Processes, the main results of which are presented in the book *Human Higher Cortical Functions and their Disorders after Local Brain Lesions* [13; 14; 10]. After the publication of this book, the term *neuropsychology*<sup>1</sup> appears for the first time in Russian academia, denoting a section of psychological knowledge that addresses the problem of the relationship between human mental activity, the psyche, and the brain.

The syndromic approach to the analysis of mental disorders arising from local lesions of the brain serves as Luria's method for studying this problem. The title book is a peculiar catechism of new knowledge, in which the main variants of neuropsychological syndromes caused by local lesions of the left hemisphere are presented in a substantial volume. Cognitive processes (and the neuropsychological factors that underpin them) are largely represented by these syndromes, which have since become classic cases. It is important to note that this is the

<sup>1</sup> The term "neuropsychology" first appeared in the work of Canadian physiologist Donald Hebb "The organization of behavior: a neuropsychological theory" in 1949

first time that a psychological factor has been introduced in this area. It is a component of various mental processes and is simultaneously underpinned by the work of certain brain structures (later, Luria's students will refer to this factor as neuropsychological).

At this stage, Luria still adheres to the medical interpretation of a syndrome, that is, understanding it as a combination of symptoms of a disease united by one cause [6]. At the same time, remaining faithful to Vygotsky, he shows that he considers the psyche as a whole, studying it not in separate mental functions, but mental functions that all interrelate [2].

At this stage of Luria's work, problems of personality are not specifically addressed.

Gradually, Luria moved away from the problem of studying cognitive processes toward to the topic of how human behavior is regulated. Luria's interest turned toward the study of mental activity as the regulation of human behavior, the programming of mental processes and control over their course. This period corresponds to the appearance in world science and practice of concepts related to computer science, and the first harbingers of information technology in the form of the first large computers. Luria started looking for answers to questions arising from research on the frontal structures of the brain.

Based on his research, Luria shows that the frontal lobes are polyfunctional and distinguishes three different syndromes in terms of their specialization: the posterior frontal, associated with the realization of kinetic work; the prefrontal, associated with the regulation of mental activity, behavior plans and programs; and the medio-basal, associated with self-awareness in the Lurian approach [9].

Although variants of the frontal syndrome have been described, the overall mystery of the frontal lobes has remained unsolved [3]. So far, the paradox of the frontal syndrome consists in a distinct dissociation between grossly impaired voluntary regulation of activity and relatively preserved complex forms of involuntary activity. Luria noted that the frontal lobe patient who is not able to memorize ten words can easily cope with this task if it is also done by a neighbor in the ward. Based on this, Luria concludes that the frontal lobes are not the "central apparatus of memory."

After the 18th International Psychological Congress in Moscow, one of the main areas of which was the problem of memory research, Luria moved on to the next stage in the development of ideas about such syndromes. This stage is associated with the study of amnesic syndrome in pathology of deep brain structures. During this period, it was fundamentally important that memory disorders were studied by Luria in patients with lesions on the entire complex of structures of Papez's circle. This implied a departure from localization (in its classical understanding in Russian neuropsychology) and a

transition to the study of brain function disturbances in disorders of jointly working brain zones [5].

The notion of the syndrome as a set of disorders of brain function due to a lesion of the whole circuit of brain structures is also covered in the book *Memory Disorders in Arterial Aneurysms of the Anterior Connective Artery* [21].

At this stage, for the first time, much attention is paid not to the cortex but to the subcortical formations that regulate mental processes, which are essentially involuntary (through trace formation). Assigning special importance to the role of subcortical nonspecific brain structures in the formation of amnesic syndrome, Luria would later revise the hierarchy of brain structures in relation to the provision and realization of mental activity in general. Within the concept of the three functional brain units, the first unit includes not the frontal lobes but the deep structures of the brain [17].

As Luria said, his initial fascination with deep psychology at the beginning of his professional career was not subjectively suspended, and he gradually returned to his "first love," his original interest. He published books such as *A Little Book about Big Memory*, the second title of which is *The Mind of the Mnemonist*, addressing the problems of personality and its inner content [12], and *The Lost and Returned World*, written in collaboration with a patient Luria befriended during World War II. The latter is devoted to the inner workings of a patient's personality on restoring his inner spatial perception of the world, which had been destroyed by a gunshot wound in the posterior parts of the left hemisphere of the brain [18].

In the 1960s, a neuropsychology laboratory headed by Luria operated at the N. N. Burdenko Institute of Neurosurgery. There were no more fortunate and joyful days for Luria than those when he had the opportunity to personally examine a patient. He liked to conduct a dialogue with the patient in which the patient became, in the words of Luria, "not a rabbit of neuropsychological examination but its active participant." Patients felt better after talking with the professor, they felt as if they were more than just their disease. Such dialogues with the professor gave them back their humanity. It was not without reason that after being discharged from the clinic and finding themselves in other cities, they sent Luria letters and thanked him for the attention he had given them. Luria invited B. V. Zeigarnik to help penetrate into the depths of what patients with lesions of the frontal lobes experienced. While she interviewed a patient "with a pencil and a piece of paper," Luria would observe the patient's behavior and reactions in response to Zeigarnik's questions. In essence, it was all focused on the patient's attitude toward the examination situation and toward the disease.

The second volume of the book *Neuropsychology of Memory* focused on the description of individual pa-

tients and can be rightly considered the apotheosis of this stage of Luria's work [16]. It is possible to say that, in this work, Luria completely moves away from syndromes in its classical (medical) sense to the description of syndromes of the individual personality.

Turning to the fact that Luria treated each syndrome as a scheme, which he repeatedly emphasized in his book *Higher Cortical Functions of Human and their Disorders in Local Brain Lesions*, a number of important determinants delineating the content of a syndrome should be noted, namely:

1) a set of basic disorders of mental functions defining the completeness or incompleteness of a neuropsychological syndrome in its classical understanding;

2) the presence of symptoms of impaired brain function not related to this type of syndrome described in the classical scheme. Luria referred to such symptoms as *neighborhood symptoms*, referring primarily to the continued growth of a tumor toward adjacent brain structures. On this basis, the students and followers of Luria have long pursued the possibility of predicting the direction of the pathological process, emphasizing that subtle functional disorders accessible by neuropsychological examination could manifest themselves long before brain dysfunctions are registered at the morphological level [7];

3) the mass of the brain involved in the pathological process [8]. It is important to note that in cases of extensive brain lesions, a neuropsychological syndrome can be aggravated by such manifestations as a decrease in activity level. This can lead to sleepiness, increased exhaustion, the disorientation of the patient regarding place, time, and their condition up to anosognosia and anosodiaphoria. Of particular interest, in this case, are the changes described regarding brain function in craniopharyngiomas: as the general brain disorders developed and symptoms appeared in the brainstem — particularly respiratory disorders — the patient's EEG recorded respiratory rhythmicity, i.e., the regulation of breathing became a function of the whole brain. This work was completed during Luria's lifetime and under his direct supervision. It is presented in the book *Brain and Memory* [25]. It was very probable to assume that the brain, based on its own afferent structures, self-regulates its states and involves in the process of breathing structures that are not ordinarily engaged in it. The aggravating influence of such manifestations on the neuropsychological status of the patient was confirmed by the remission of the syndrome as the general cerebral symptomatology regressed;

4) the functional status of a structure in a state of destruction, behind which lies the general mode of the brain in deficit conditions, such as protective inhibition;

5) individual developmental features including the lateral organization profile, environmental and cultural features [24], the degree of function automatization

and interiorization during ontogenesis, the sphere of professional interests, personal and semantic components, etc.

Some of the facts described as part of the framework of neuropsychological syndromes in the Lurian methodology were ahead of their time in terms of understanding the brain's structure and functions, and are now being verified through the use of modern neuroimaging methods.

Emerging data on the reticulo-frontal complex structures explain the secondary frontal syndrome in cerebellar tumors described in 1977 by Luria in co-authorship with Melnikova [29; 4]. Data on specific speech disorders in thalamic lesions and close to amnesic aphasia [23] find confirmation in work on thalamo-parietal connections. All this once again shows the inexhaustible possibilities of the method proposed by Luria and how universally it can be applied in the assessment of human mental functioning.

Luria attached great importance to the syndromic approach, often referring to Spinoza's statement that method is the mother of science. One day Luria's young employees, wanting to flatter him, asked him who the father of science was. Luria chuckled and said that the father of science is fact. "A neuropsychologist skilled in the method of syndromic analysis," Luria continued, "is like a criminal investigator investigating a crime. Each symptom of an individual brain function disorder serves as a clue. The neuropsychologist collects evidence in the form of other disorders of mental functions and identifies the factor that unites them. It is important to add that in each neuropsychological syndrome, there is also an alibi in the form of links preserved in the structure of mental activity. It is the attention to the clues and the desire to understand them that determines the method of research." So, for the first time in the autumn of 1976, in a sanatorium named Narrow, Luria clearly pointed out the binary structure of neuropsychological syndromes, indicating the presence of disturbed and preserved mental functions therein.

## Conclusion

In recent decades, the field of neuropsychological diagnosis has expanded considerably, and the overly mechanical nature by which the Lurian syndrome schema is applied is alarming. The latter leads to overdiagnosis and is especially dangerous when dealing with brain function in childhood and old age. The same is true when assessing brain function disorders as actually observed consequences of mental and somatic (including Covid-19) diseases in the form of distinct changes in neuropsychological functioning. In this regard, applying the Lurian approach requires a meaningful understanding of the syndrome in its entirety.

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